

NASA TECH BRIEF

Manned Spacecraft Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Third Order Digital-To-Analog Converter

A digital-to-analog converter system, utilizing third order interpolation between sample points, improves the accuracy of the reconstructed analog signal without increasing sample rates.

The converter system consists of a sample and hold digital-to-analog converter, a clock circuit, a sample delay circuit, an initial condition circuit, and an interpolator circuit. The sample and hold digital-to-analog converter changes the pulse code modulated telemetry signal to a pulse amplitude modulated signal. The output of the converter feeds the sample delay circuit, which stores the four most recent data points. The data points are inputs for the initial condition circuitry, which calculates the coefficients of a third order polynomial equation. An additional circuit interpolates between two data points. As the initial condition circuit receives a new data point, it drops the oldest point and computes new coefficients for the interpolator. The interpolator output is a smooth (piecewise) continuous signal.

An analog computer simulation of the third order digital-to-analog converter showed, that for normalized sampling frequencies above five samples per cycle, a converter which uses third order interpolation provides the same results as a conventional sample and hold digital-to-analog converter with twice the normalized sample rate. Incorporating a third order interpolator into a

digital-to-analog converter will provide better accuracy or will permit lower sampling rates to be used with a commensurate saving in system bandwidth.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Manned Spacecraft Center, Code JM7
Houston, Texas 77058
Reference: TSP72-10030

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to:

Patent Counsel
Code AM
NASA Manned Spacecraft Center
Houston, Texas 77058

Source: W. P. Dotson
Manned Spacecraft Center
(MSC-12458)

Category: 02